SWB222DP

Digital stepper driver

User's guide V1.3

This manual introduces the usage and safety precautions of the product.

- Please read this manual carefully before use. be cautious while using the product.
- Please keep this manual in the right place in order to check at any time after reading it.

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Safety precautions

Pay attention to the warning in case people getting hurt or device being damaged.

The "danger" and "warning" symbol below is in accordance with its hazard degree.

Danger **Indicates a potentially hazardous situation which may results in a serous injury even death if used improperly**

Warning **Indicates a potentially hazardous situation which may results in moderate injury, minor injury or device damaged if used improperly.**

The following notation indicates which is prohibited and which must obey.

Indicates the operation must be done

Indicates the operation must be prohibited

WARNING

Don't let product touch water, corrosive gases, flammable and combustible matetials

May result in fire or electric shock if disobey this

Don't put your handle in the driver

May result in electric shock if disobey this

Obey provisions of the voltage

May result in fire, machine damaged or personal injury if disobey this

The motor should not contact with the machine in the JOG mode

May result in machine damaged if disobey this

Don't change, removal or repair the driver

May result in electric shock or personal injury if disobey this

Make sure the right connection

May result in electric shock, machine damaged or personal injury if disobey this

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Introduction

2.1 Summary

SWB222DP is the stepper driver that has extreme low noise. Users can set subdivision and current arbitrarily in the range, which makes the driver satisfy many occasions. With subdivision built-in the driver, the driver has same effection of high subdivision even in the condition of low subdivision. The driver can run very stably.

2.2 Features

- The latest special motor control DSP chip;
- Advanced vector loop control which makes the stepper motor has lower heat;
- Subdivision built in the driver;
- Automatic half-current;
- Differential signal input with isolation of the optocoupler;
- The static and dynamic current can be set arbitrarily(range from 0 to 6A);
- The compatibility of the 2 phase stepper motor with 4-wire,6-wire and 8-wire;
- Up to 200KHZ frequency response;
- The subdivision of arbitrary(range from 1 to 256);
- The protection of overcurrent ,overvoltage ,extreme position error and so on;

2.3 Application area

Be suitable for all kinds of small and medium-sized automation equipment and instruments, for example: engraving machine, stripping machine, marking machine, cutting machine, laser Phototypesetting, plotter, numerical control machine, automatic assembly equipment etc..

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Electrical, mechanical and environmental indicator

3.1 Electrical specifications

parameter	MIN.	TYP.	MAX.	UNIT
Continuous output current	0	-	5.6	A
Input supply voltage	24		80	DC
Logic input current	7	10	20	mA
Pulse frequency	0	-	200	kHz
Insulation resistance	500			MΩ

3.2 Environmental parameter

Cooling method	Natural cooling or additional radiator	
Operating conditions	Operation environment	Stay away from dust ,oil mist and corrosive gas
	Temperature	0℃－50℃
	Humidity	40－85%RH
	Vibration	5.9 m/s^2 Max
Storage conditions	-25℃－+70℃	

3.3 Mechanical installation (unit: mm)

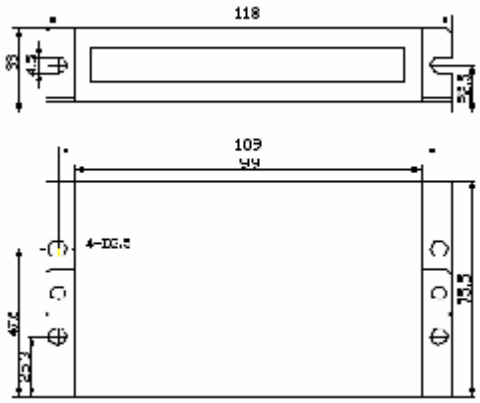

Fig. 1 dimensions

3.4 Installation

Erect or side mounted; the distance between the 2 drivers shall be not less than 20mm.

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Interface

Digital stepper driver SWB222DP increases communication interface compared with traditional stepper driver, as shown in figure 2:

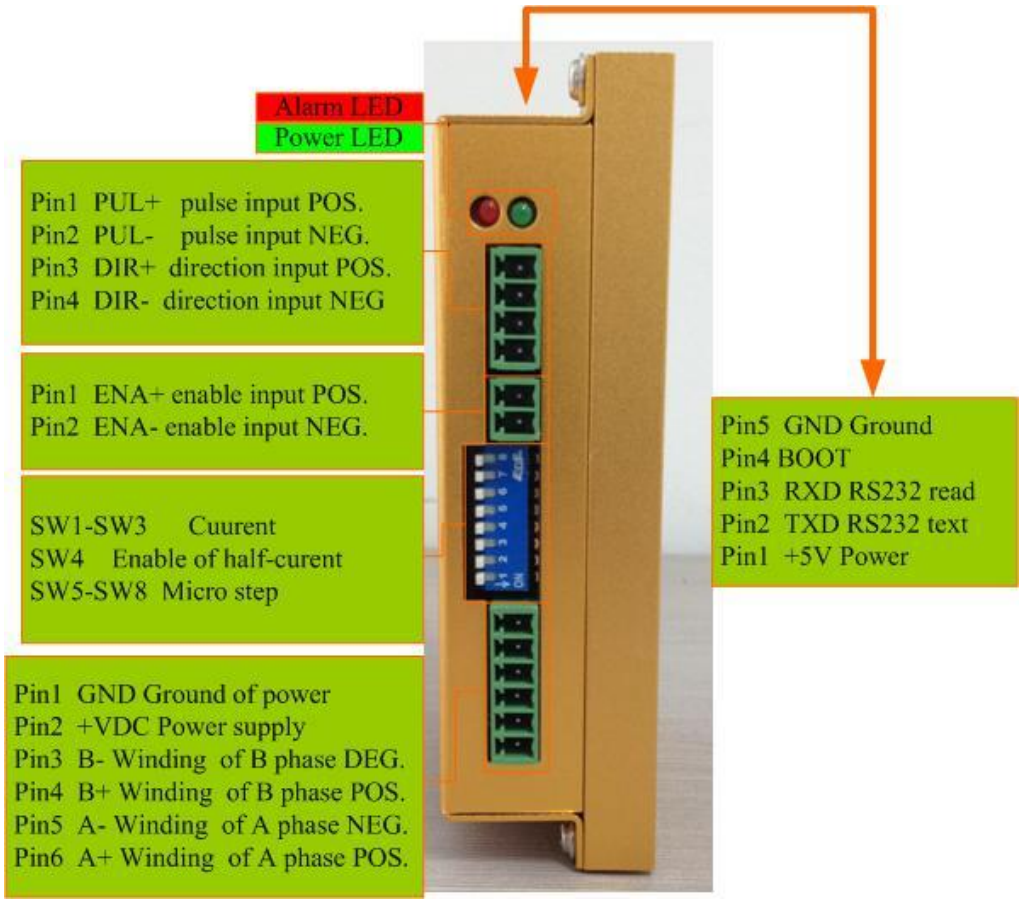
Alarm LED
Power LED
Pin1 PUL+ pulse input POS.
Pin2 PUL- pulse input NEG.
Pin3 DIR+ direction input POS.
Pin4 DIR- direction input NEG
Pin1 ENA+ enable input POS.
Pin2 ENA- enable input NEG.
SW1-SW3 Cuurent
SW4 Enable of half-curent
SW5-SW8 Micro step
Pin1 GND Ground of power
Pin2 +VDC Power supply
Pin3 B- Winding of B phase DEG.
Pin4 B+ Winding of B phase POS.
Pin5 A- Winding of A phase NEG.
Pin6 A+ Winding of A phase POS.
Pin5 GND Ground
Pin4 BOOT
Pin3 RXD RS232 read
Pin2 TXD RS232 text
Pin1 +5V Power

Fig. 2 interface

4.1 Control signal

symbol	name	index
PUL＋	Pulse input POS.	The stepper motor will rotate if there comes a input signal of rising level. -0.3~5.3V input voltage, high level at 4~5V and low level at 0~1V. Pulse width shall be greater than 1.2us. you shall cascade resistance in the input circuit if input voltage is greater than 5V.
PUL－	Pulse input NEG.	
DIR＋	Direction input POS.	The stepper motor will change its rotate direction if input signal change if rising level. -0.3~5.3V input voltage, high level at 4~5V and low level at 0~1V. You shall cascade resistance in the input circuit if input voltage is greater than 5V.
DIR－	Direction input NEG.	
ENA＋	Enable input POS.	-0.3~5.3V input voltage, high level at 4~5V and low level at 0~1V. You shall cascade resistance in the input circuit if input voltage is greater than 5V. In the state of high level or suspend, the stepper motor is in control. Otherwise, the stepper motor is at free.
ENA－	Enable input NEG	

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4.2 Stepper motor and supply voltage

symbol	name	index
A＋	Winding of A phase POS.	The rotate direction will change if the winding of A phase POS. and NEG. exchange.
A－	Winding of A phase NEG.	
B＋	Winding of B phase POS.	The rotate direction will change if the winding of B phase POS. and NEG. exchange.
B－	Winding of B phase NEG.	
+VDC	Input voltage	24~80VAC.
GND	Power grand voltage	0V

4.3 RS232 communication

PC can be connected to the stepper driver via a dedicated serial cable. The parameter needed by the customer can be set by PC through software named stepdrive.

NO.	symbol	name	index
1	+5V	Power supply	
2	TxD	RS232 text	
3	RxD	RS232 read	
4	BOOT	DSP program guide selection pin	Upgrade the program when it's connected to the power grand
5	GND	Power grand	

NOTE: the cable between SWB222DP and PC must be customized, please confirm it so as to prevent stepper driver being hurt.

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4.4 Status indication

The green LED keeps bright when the power of stepper driver is on. The red LED keeps bright when the stepper driver encounters an error. The information of alarm can only been clean by the reset of stepper driver. The red LED output information of alarm circularly. The short light means 0 and long light means 1. There are 5 bits which high bit is first and low bit is behind. The information of alarm can be expressed as below:

CODE	index
0x00000(0)	Normal
0x00001(1)	The encoder of A and B phase ids wrong
0x00010(2)	The output current is out of control
0x00011(3)	Overcurrent
0x00100(4)	Extreme wrong position
0x00101(5)	Overload
0x00110(6)	The deviation of ADC base overflows
0x00111(7)	The deviation if ADC channel overflows
0x01000(8)	Undervoltage
0x01001(9)	Overvoltage
0x01010(10)	EEPROM goes wrong

The stepper driver will output information of alarm and stop driving the motor. It only can be cleaned by reset.

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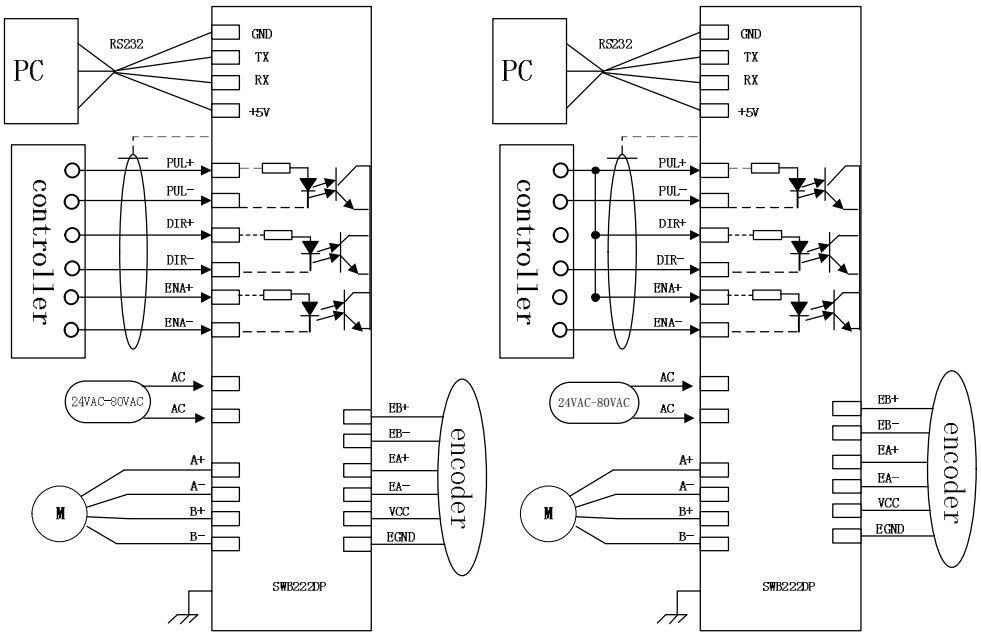
Terminal

5.1 Typical terminal

The typical terminal of stepper diver is as shown below;



Terminal of differential signal Terminal of single signal

Fig. 3 Typical terminal

NOTE：Please confirm the positive and negative pole so as to prevent the stepper driver from being damaged.

5.2 Terminal of control signal

Terminal of input and output signal is as shown below;

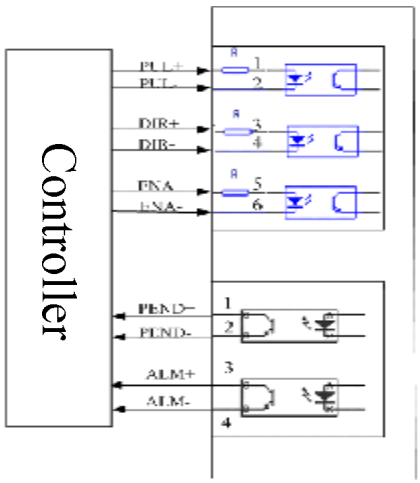


Fig. 4（a）The terminal of differential signal

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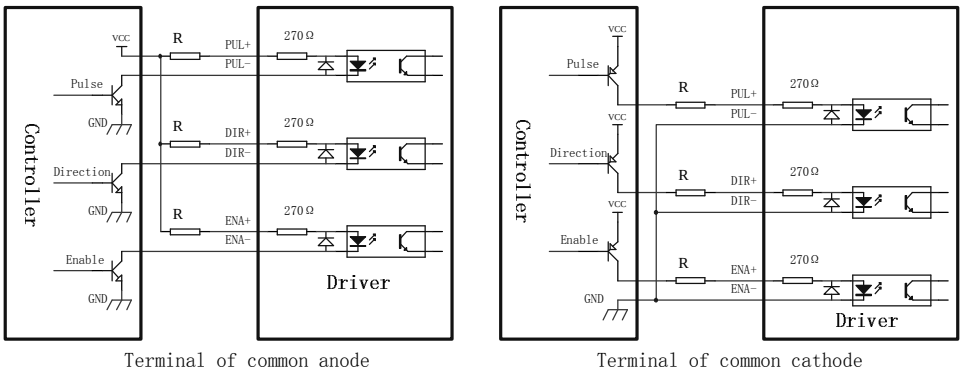

Fig. 4(b) the terminal of single signal

NOTE：If level of control signal is under +5V, no external resistor is needed. Otherwise, the external resistors are needed. +12V is 1K and +24 is 2k.

5.2 Timing of control signal

The signal of PUL, DIR and ENA need some requirements so as to avoid misoperation and deviation. The requirements are as shown below:

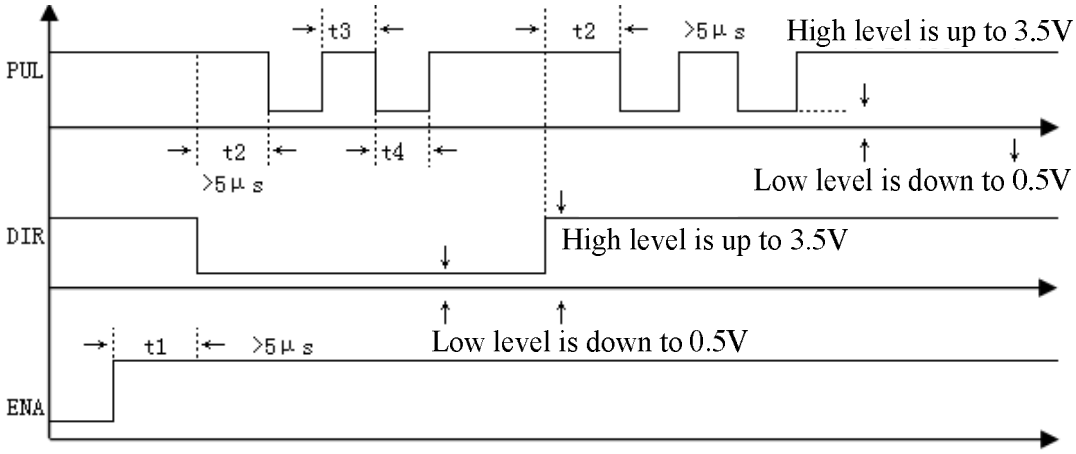

Fig. 5 Timing

Notes：

（1）t1：ENA should be at least 5us before DIR. It’s effective when the ENA level id high level or suspend.

（2）t2：DIR should be at least 5us before PUL.

（3）t3：The pulse width should not less than 5us.

（4）t4：The width of high and low level should not less than 2.5us.

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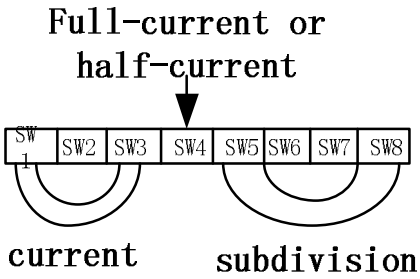
Dial switch

SWB222DP set the subdivision and current of motor by using 8 dial switches



Set of subdivision and current

Maximum output current	Continuous output current	SW1	SW2	SW3	Steps per circle	SW5	SW6	SW7	SW8
1.5A	1.1A	OFF	OFF	OFF	200	ON	ON	ON	ON
2.1A	1.5A	ON	OFF	OFF	400	OFF	ON	ON	ON
2.7A	1.9A	OFF	ON	OFF	800	ON	OFF	ON	ON
3.2A	2.3A	ON	ON	OFF	1600	OFF	OFF	ON	ON
3.8A	2.7A	OFF	OFF	ON	3200	ON	ON	OFF	ON
4.3A	3.1A	ON	OFF	ON	6400	OFF	ON	OFF	ON
4.9A	3.5A	OFF	ON	ON	12800	ON	OFF	OFF	ON
5.6A	4.0A	ON	ON	ON	25600	OFF	OFF	OFF	ON
					1000	ON	ON	ON	OFF
					2000	OFF	ON	ON	OFF
					4000	ON	OFF	ON	OFF
					5000	OFF	OFF	ON	OFF
					8000	ON	ON	OFF	OFF
					10000	OFF	ON	OFF	OFF
					20000	ON	OFF	OFF	OFF
					25000	OFF	OFF	OFF	OFF

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Set of parameter

Parameter must be set through RS232 serial communication port of PC and it's ser by the software named stepdrive. By using it, the users can change the parameters they need easily. Detailed settings are as shown below;

NUM.	NAME	MIN.	TYP.	MAX.	UNIT	INDEX
P0-0	Software Version	0	0	10000		Read only
P0-2	MOL. of electronic gear	1	1	500		The design of stepper motor pulses per circle. Pulses per circle = $\frac{360}{\text{Angles per step}} * \frac{\text{MOL. of electronic gear}}{\text{DEN. of electronic gear}}$ That is subdivision= $\frac{\text{MOL. of electronic gear}}{\text{DEN. of electronic gear}}$. It's effective only if P0-15 = 1.
P0-3	DEN. of electronic gear	1	1	500		
P0-4	Running current	1	1000	8000	mA	The set of running current.
P0-5	Rate of standby current	1	300	1024	1/1024	Set of standby current, it's in cooperation with P0-4. Standby current = $\frac{\text{Setting}}{1024} * \text{Running cuurent}$
P0-6	Delay time of standby current	1	50	30000	ms	The decay time from no pulse coming to standby time.
P0-7	Max current of closed-loop	1024	3072	10240	mA	The max control current of closed-loop, it's in cooperation with P0-1.
P0-9	Rotate of reverse direction	0	1	0		Set of rotate direction. 0 = do not change, 1 = change the direction.
P0-12	Steps of position deviation	1	2	4000		Stepper driver will alarm if steps of position deviation exceed what users set.
P0-13	Polarity of alarm	0	1	0		The terminal between output of differential signal when stepper driver

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	output					alarm. 0＝ON, 1=OFF
P0-15	Enable of dial switch	0	1	0		Stepper driver will be accordance with settings, which include current and subdivision, by dial switch if it's not prohibited. Otherwise, stepper driver will be accordance with settings by software named stepdrive. 0＝not prohibited, 1＝prohibited
P0-16	Polarity of SON	0	1	1		The input of high level or suspension will make the driver enable if it's ON. Otherwise, The input of low level will make the driver enable 0＝OFF,1＝ON
P1-5	Minimum of input voltage	10	24	200		Stepper driver will alarm if the input voltage is less than this setting.
P1-6	Maximum of input voltage	10	80	200		Stepper driver will alarm if the input voltage is more than this setting.
P1-8	Save of paramete r	0	1	0		Choose whether the set of parameter will save or not if power is down. 0=save 1=not save
P1-10	JOG mode	0	1	1		Choose whether the pulses that drive stepper driver rotate come from outside or inside. 0＝inside 1=outside

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Diagnosis and treatment

Phenomenon	Possible problem	Treatment
Stepper motor does not rotate	LED of power is off	Check the power
	Pulse does not meet the requirements	Check the voltage, width and value of high and low level.
	Subdivision is too small	Change the setting subdivision
	Current is too small	Change the current
	Alarm output	Reset on power
	Level of enable signal is low	Make the level if this signal high or suspend it.
Wrong rotate direction	Wrong terminal of motor	Exchange any line of the same phase.
	Setting of P0-9 is wrong	Change the setting of P0-9
Inaccurate position	Bad terminal of pulse signal	Reterminal
	Interference of signal	Remove the interference
	Wrong subdivision	Change the setting of subdivision
	Current is too small	Increase the current
Stall	Acceleration time is too short	Lengthen acceleration time
	Torque of motor is too small	Change the motor of more torque
	Voltage of power supply or current is too small	Increase the voltage of power supply or current

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